

## N- and P-Channel 20-V (D-S) MOSFET

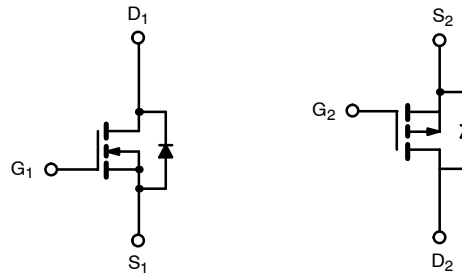
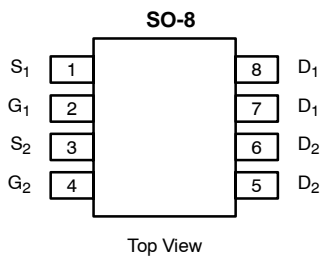
PRODUCT SUMMARY			
	V <sub>DS</sub> (V)	r <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)
N-Channel	20	0.0145 @ V <sub>GS</sub> = 10 V	9.6
		0.017 @ V <sub>GS</sub> = 4.5 V	8.6
P-Channel	-20	0.033 @ V <sub>GS</sub> = -4.5 V	-6.2
		0.050 @ V <sub>GS</sub> = -2.5 V	-5

### FEATURES

- TrenchFET® Power MOSFET

### APPLICATIONS

- Level Shift
- Load Switch



Ordering Information: Si4511DY  
 Si4511DY-T1 (with Tape and Reel)  
 Si4511DY—E3 (Lead (Pb)-Free)  
 Si4511DY-T1—E3 (Lead (Pb)-Free with Tape and Reel)

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25°C UNLESS OTHERWISE NOTED)							
Parameter	Symbol	N-Channel		P-Channel		Unit	
		10 sec.	Steady State	10 sec.	Steady State		
Drain-Source Voltage	V <sub>DS</sub>	20		-20		V	
Gate-Source Voltage	V <sub>GS</sub>	±16		±12			
Continuous Drain Current (T <sub>J</sub> = 150°C) <sup>a, b</sup>	I <sub>D</sub>	T <sub>A</sub> = 25°C	9.6	7.2	-6.2	-4.6	A
		T <sub>A</sub> = 70°C	7.7	5.8	-4.9	-3.7	
Pulsed Drain Current	I <sub>DM</sub>	40		-40		A	
Continuous Source Current (Diode Conduction) <sup>a, b</sup>	I <sub>S</sub>	1.7	0.9	-1.7	0.9		
Maximum Power Dissipation <sup>a, b</sup>	P <sub>D</sub>	T <sub>A</sub> = 25°C	2	1.1	2	1.1	W
		T <sub>A</sub> = 70°C	1.3	0.7	1.3	0.7	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150				°C	

THERMAL RESISTANCE RATINGS							
Parameter	Symbol	N-Channel		P-Channel		Unit	
		Typ	Max	Typ	Max		
Maximum Junction-to-Ambient <sup>a</sup>	R <sub>thJA</sub>	t ≤ 10 sec	50	62.5	50	62.5	°C/W
		Steady-State	85	110	90	110	
Maximum Junction-to-Foot (Drain)	R <sub>thJF</sub>	30	40	30	35		

Notes  
 a. Surface Mounted on FR4 Board.  
 b. t ≤ 10 sec

SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)							
Parameter	Symbol	Test Condition		Min	Typ <sup>a</sup>	Max	Unit
<b>Static</b>							
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	N-Ch	0.6		1.8	V
		V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	P-Ch	-0.6		1.4	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±16 V	N-Ch			±100	nA
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V	P-Ch			±100	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V	N-Ch			1	μA
		V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V	P-Ch			-1	
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C	N-Ch			5	
		V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C	P-Ch			-5	
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V	N-Ch	40			A
		V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -4.5 V	P-Ch	-40			
Drain-Source On-State Resistance <sup>b</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 9.6 A	N-Ch		0.0115	0.0145	Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -6.2 A	P-Ch		0.022	0.033	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 8.6 A	N-Ch		0.0135	0.017	
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -5 A	P-Ch		0.035	0.050	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 9.6 A	N-Ch		33		S
		V <sub>DS</sub> = -15 V, I <sub>D</sub> = -6.2 A	P-Ch		17		
Diode Forward Voltage <sup>b</sup>	V <sub>SD</sub>	I <sub>S</sub> = 1.7 A, V <sub>GS</sub> = 0 V	N-Ch		0.8	1.2	V
		I <sub>S</sub> = -1.7 A, V <sub>GS</sub> = 0 V	P-Ch		-0.8	-1.2	
<b>Dynamic<sup>a</sup></b>							
Total Gate Charge	Q <sub>g</sub>	N-Channel V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 9.6 A P-Channel V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -6.2 A	N-Ch		11.5	18	nC
Gate-Source Charge	Q <sub>gs</sub>		N-Ch		3.7		
			P-Ch		4.1		
Gate-Drain Charge	Q <sub>gd</sub>		N-Ch		3.3		
		P-Ch		4.3			
Turn-On Delay Time	t <sub>d(on)</sub>	N-Channel V <sub>DD</sub> = 10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≅ 1 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 6 Ω P-Channel V <sub>DD</sub> = -10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≅ -1 A, V <sub>GEN</sub> = -4.5 V, R <sub>g</sub> = 6 Ω	N-Ch		12	20	ns
Rise Time	t <sub>r</sub>		N-Ch		12	20	
			P-Ch		30	45	
Turn-Off Delay Time	t <sub>d(off)</sub>		N-Ch		55	85	
			P-Ch		70	105	
Fall Time	t <sub>f</sub>		N-Ch		15	25	
			P-Ch		50	75	
Source-Drain Reverse Recovery Time	t <sub>rr</sub>		I <sub>F</sub> = 1.7 A, di/dt = 100 A/μs	N-Ch		50	
		I <sub>F</sub> = -1.7 A, di/dt = 100 A/μs	P-Ch		40	80	

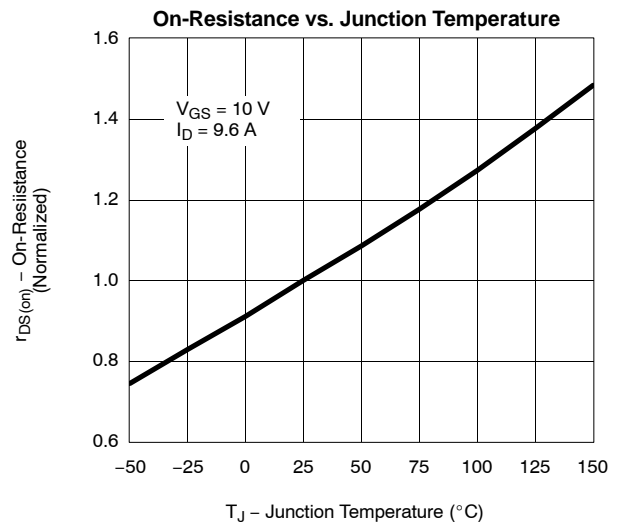
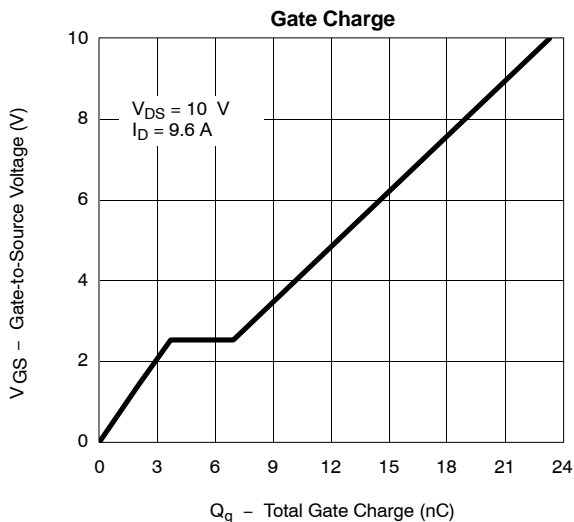
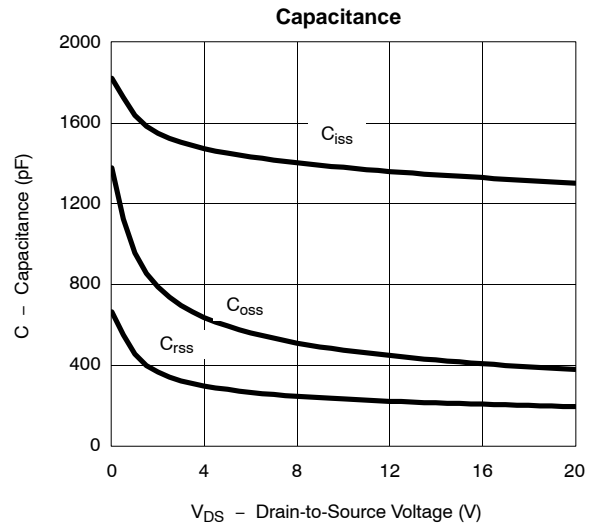
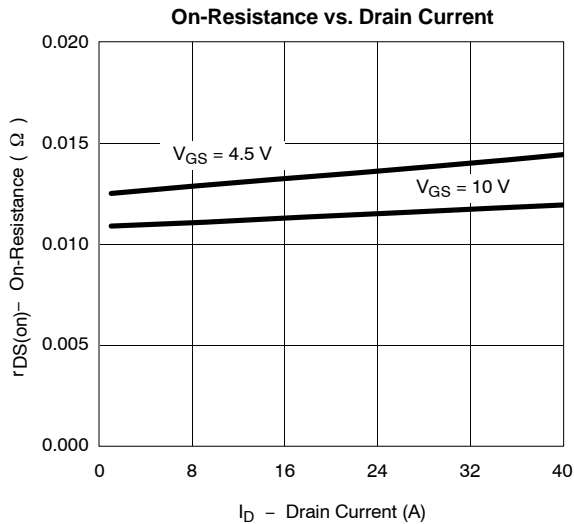
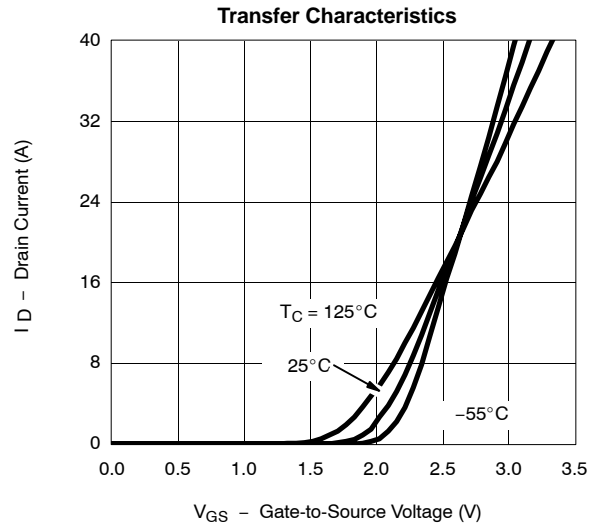
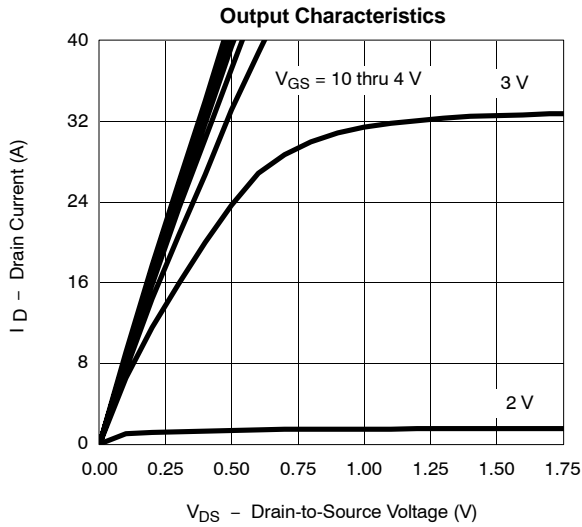
## Notes

- a. Guaranteed by design, not subject to production testing.  
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.



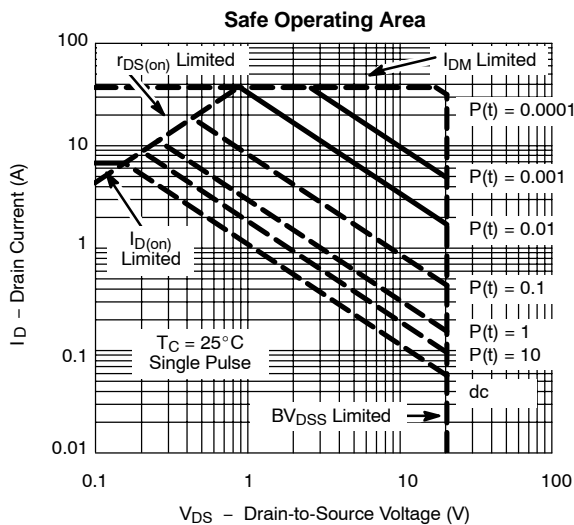
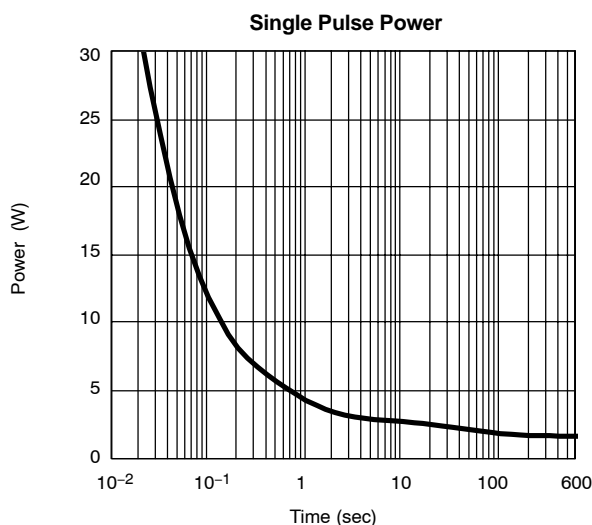
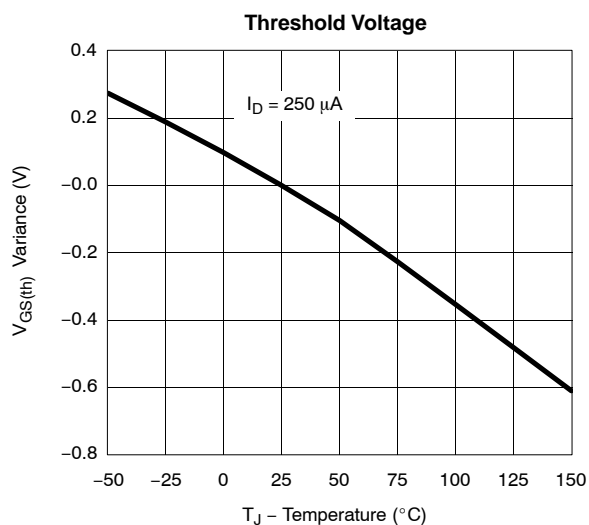
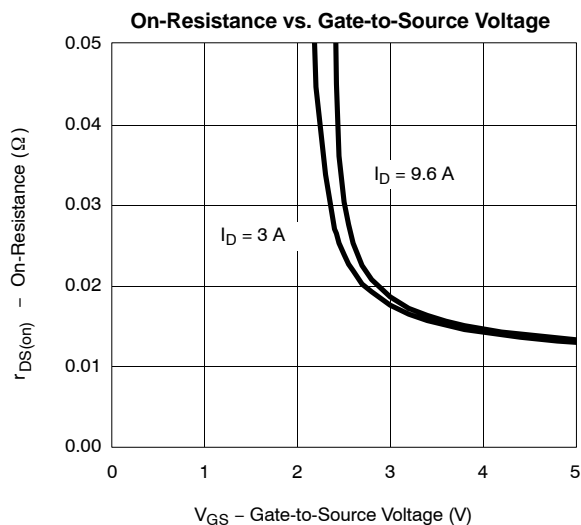
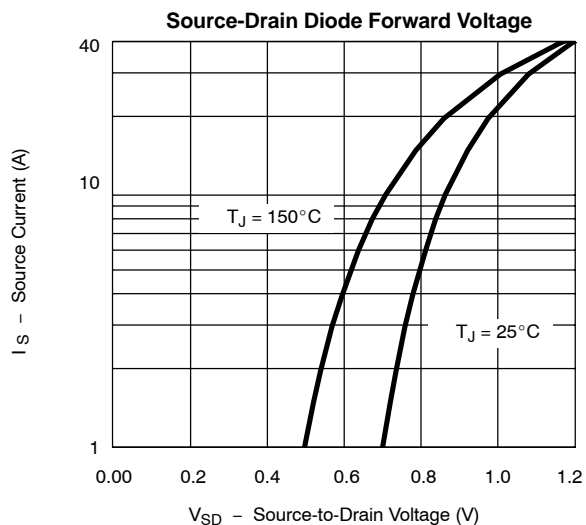
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

**N-CHANNEL**



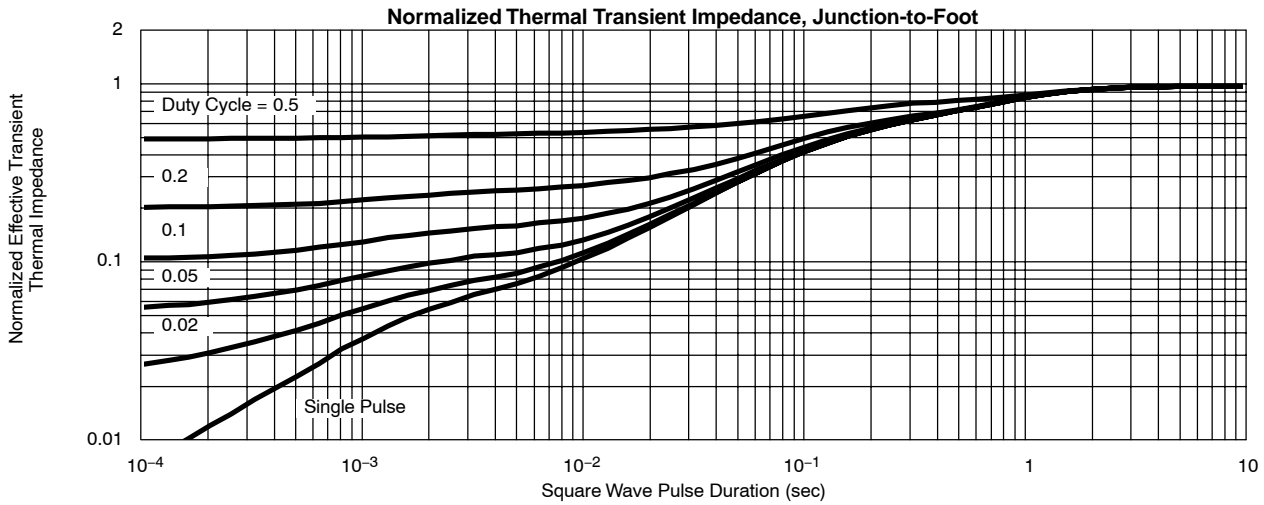
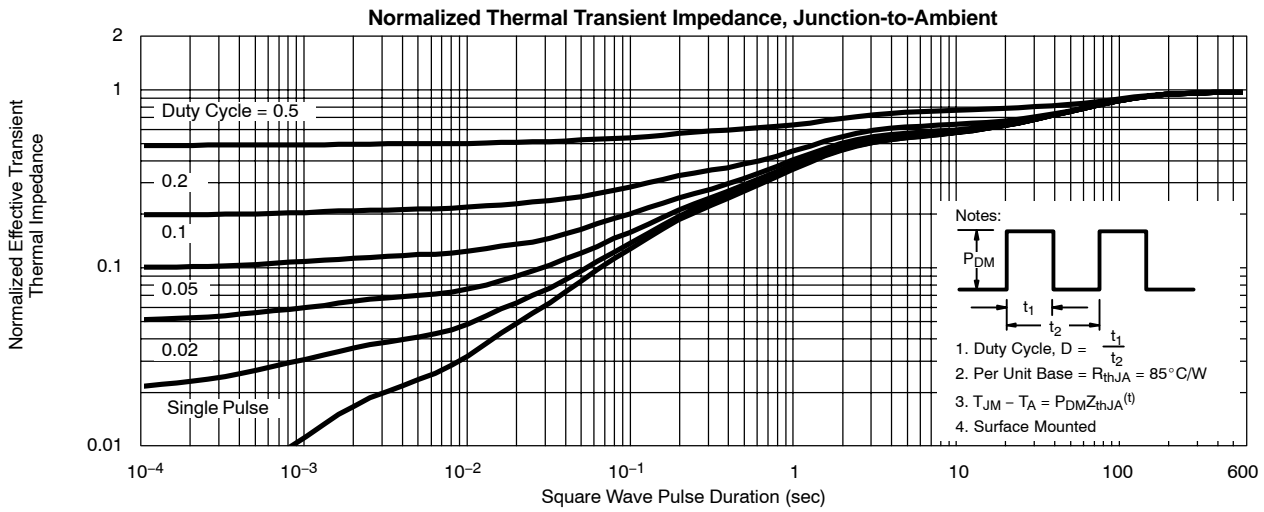
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**N-CHANNEL**

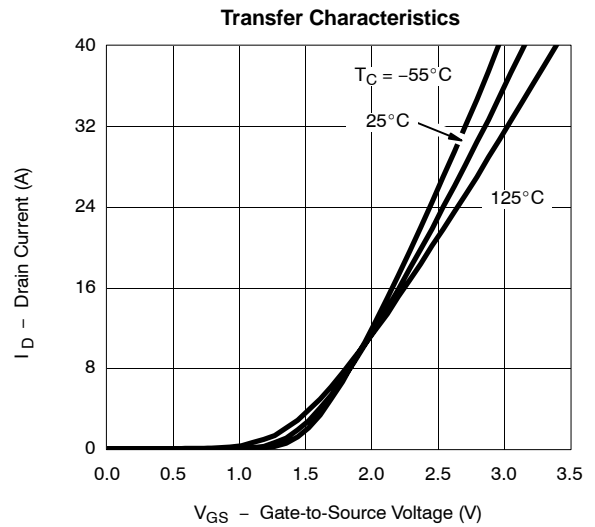
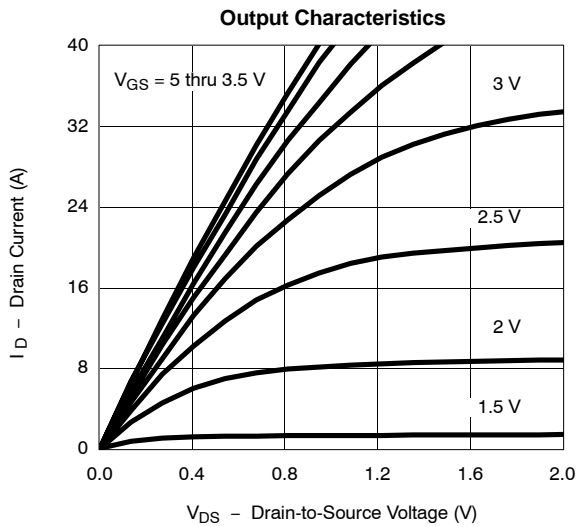




**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED) N-CHANNEL**



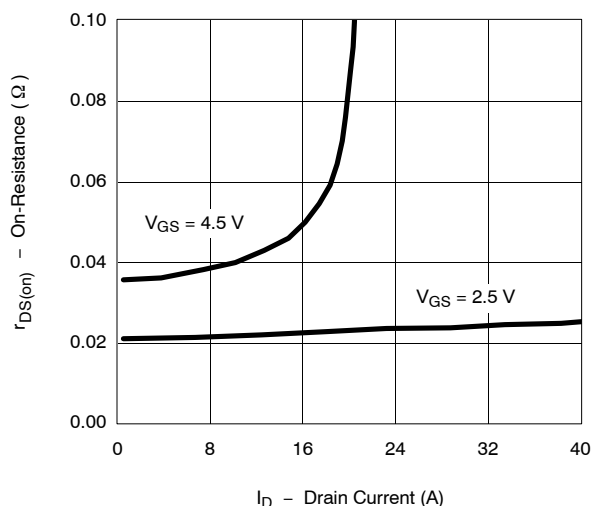
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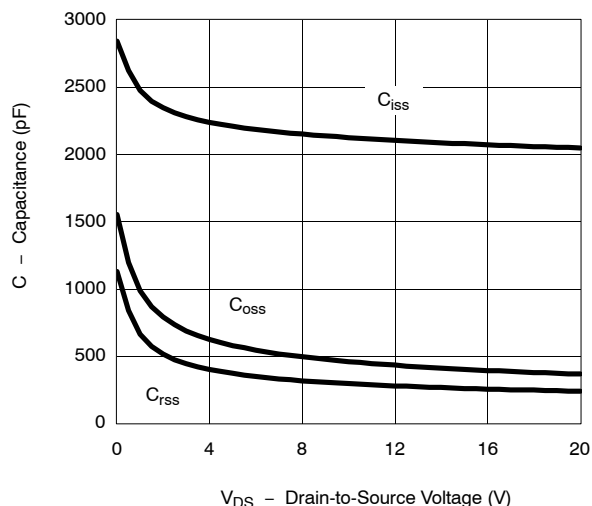
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

**P-CHANNEL**

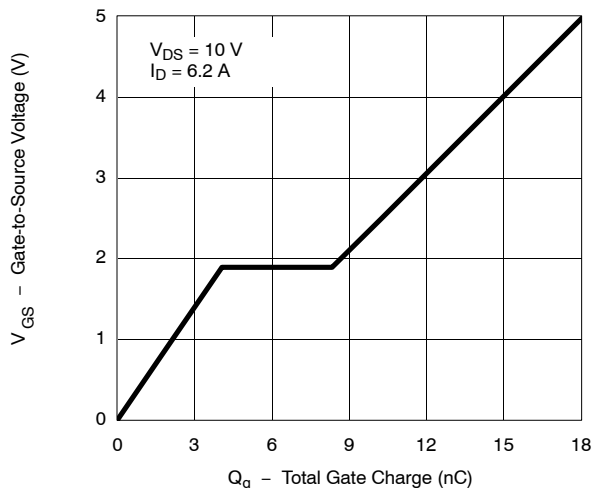
**On-Resistance vs. Drain Current**



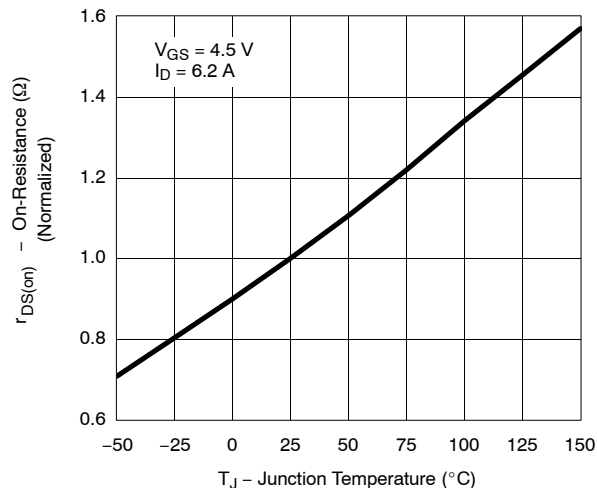
**Capacitance**



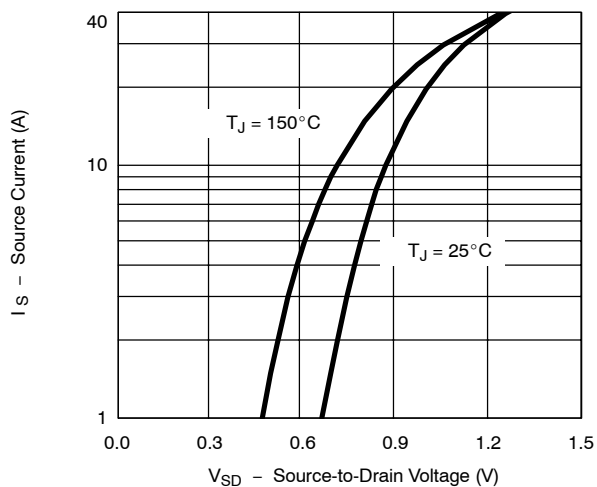
**Gate Charge**



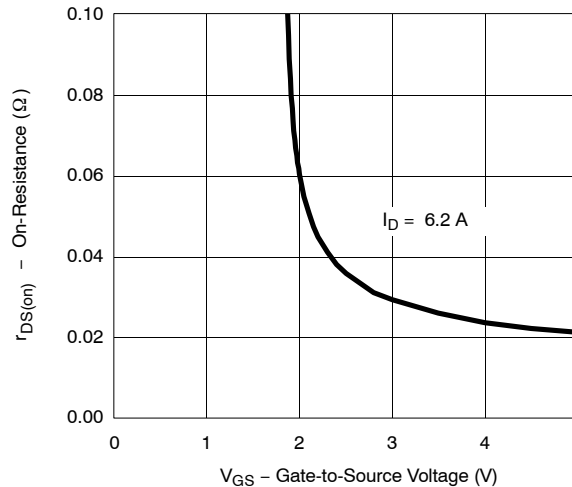
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

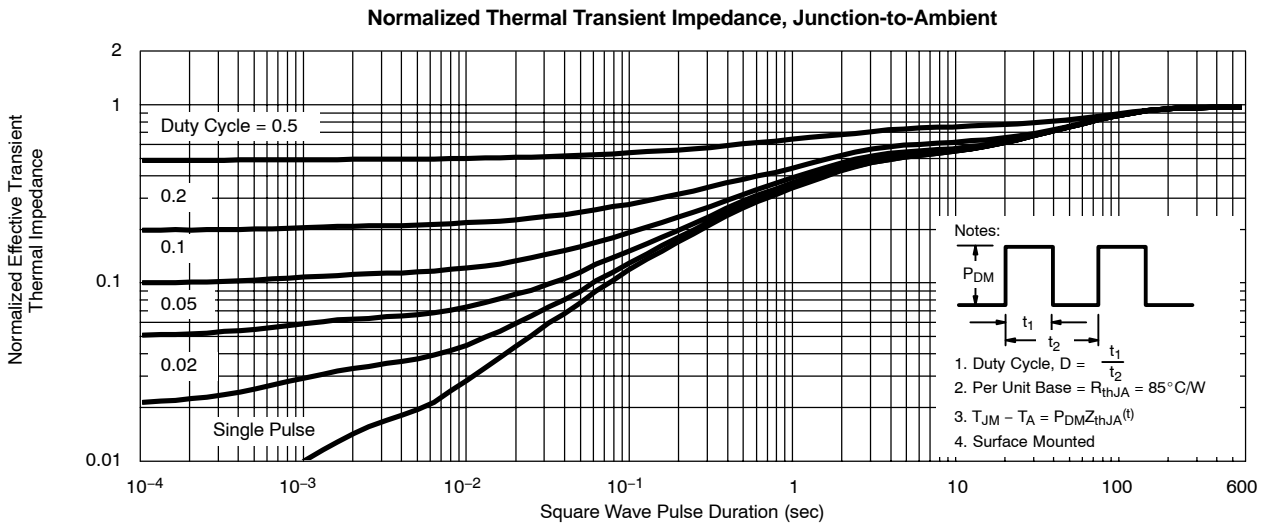
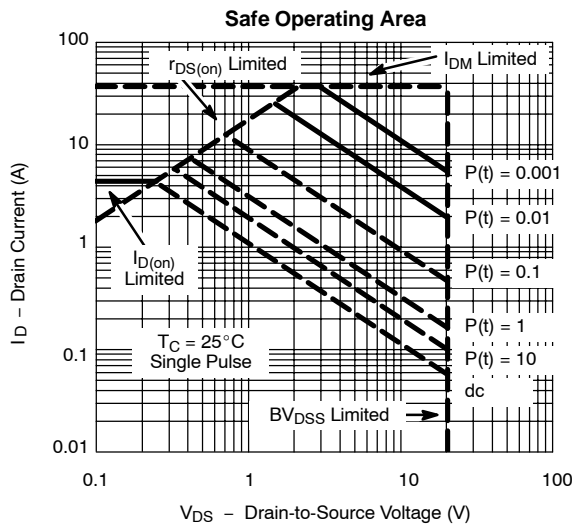
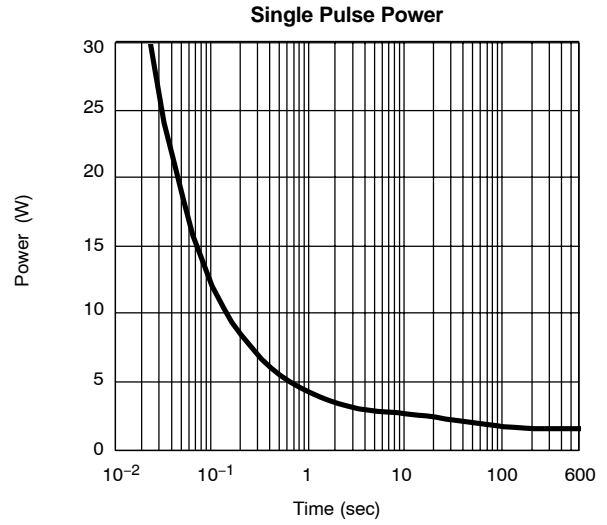
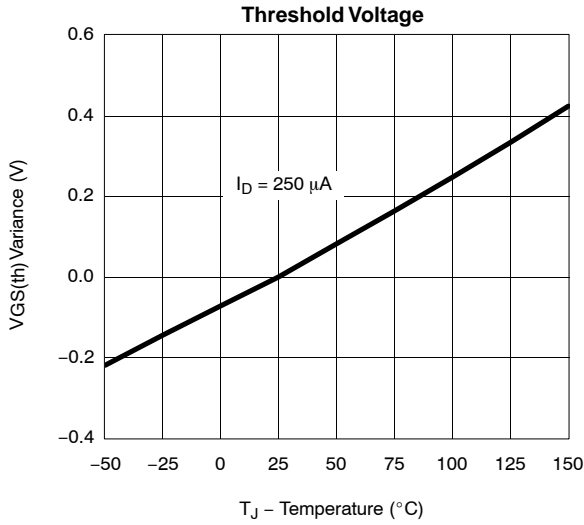


**On-Resistance vs. Gate-to-Source Voltage**





**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED) P-CHANNEL**



**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

**P-CHANNEL**

